PROGRAM BRIEF

Patient Safety Research Highlights

The mission of AHRQ is to improve the quality, safety, efficiency, and effectiveness of health care by:

- Using evidence to improve health care.
- Improving health care outcomes through research.
- Transforming research into practice.

Introduction

Medical errors are a serious problem in health care and a major concern to patients as well as to the health care industry. The Agency for Healthcare Research and Quality (AHRQ) has long been committed to a systematic approach to the issue of patient safety in medical practice. As the lead agency within the U.S. Department of Health and Human Services working to prevent errors and improve patient safety, AHRQ's goal is to reduce the potential of patient harm by promoting and supporting research.

Since fiscal year 2001, AHRQ has funded more than 100 patient safety projects. The investigators for these projects worked on different aspects of patient safety, ranging from system-wide event reporting methods to specific measures to minimize known medical errors in particular situations. Many of these studies produced new findings, tools, and products that can be used by the health care system, health care providers, and researchers to improve patient safety. Brief descriptions of these tools and findings (typically published in journal articles) are presented within the following categories:

- Fatigue and Patient Safety
- Technology
- Event Reporting
- Medication Safety
- Communication and Patient Support
- Clinical Practice Change
- Organizational Change
- Education and Training
- Safety in Intensive Care Units (ICUs)

Fatigue and Patient Safety

Medical interns who work extended-duration shifts double their risk of car crashes when driving home from the hospital. First-year doctors in training, or medical interns, who work shifts longer than 24 hours are more than twice as likely to have a car crash leaving the hospital and five times as likely to have a "near miss" incident on the road as medical interns who work shorter shifts. The article

NOTE: Items marked with a check mark (✓) are new to this revised *Program Brief*.

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reporting this finding is among a series of studies on the impact of extended work hours and fatigue on interns conducted by the Divisions of Sleep Medicine at the Brigham and Women's Hospital and the Harvard Medical School in Boston. All three studies were co-funded by AHRQ and the Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health.
Project Title: Effects of Extended Work Hours on ICU Patient Safety
Research Area: WC
AHRQ Grant: HS12032
Principal Investigator: Charles Czeisler, M.D.
Reference: Barger LK, Cade BE, Ayas NT, Cronin JW, Rosner B, Speizer FE, Czeisler CA. Harvard Work Hours, Health, and Safety Group. Extended work shifts and the risk of motor vehicle crashes among interns. *N Engl J Med.* 2005 Jan 13;352(2):125-34.

Sleep deprivation affects clinical performance of medical interns, surgical residents, and anesthesiologists. Patient care may be compromised if a fatigued, sleep-deprived clinician is allowed to operate, administer an anesthetic, manage a medical crisis, or deal with an unusual or cognitively demanding clinical case. AHRQ researchers reviewed the consequences of sleep loss in controlled laboratory environments and in clinical studies involving medical personnel. Sleep-deprived medical interns performed poorly; detected fewer cardiac arrhythmias; and complained of feeling sad, fatigued, and unsure of themselves when compared with rested interns. With increasing sleep loss, surgical residents were slower and made more errors in a virtual reality simulation of laparoscopic surgery. Sleep-deprived anesthesiologists needed more time to accomplish routine tasks in actual patient care settings, and some anesthesiologists fell asleep while administering anesthesia in a simulation study.
Project Title: Standardized Encounters to Study Patient Safety
Research Area: DCERPS
AHRQ Grant: HS11521
Principal Investigator: Matthew B. Weinger, M.D.
Reference: Weinger MB, Ancoli-Israel S. Sleep deprivation and clinical performance. JAMA 2002 Feb 27;287:955-7.

Suggestions to help sleep-deprived night shift nurses avoid impaired performance. Night shift nurses are usually sleep-deprived and may have impaired performance, miss subtle signs of patient deterioration, and fail to detect medication errors. AHRQ researchers suggest some tools to counter this problem, such as avoiding back-to-back shifts, limiting overtime, allowing nurses to sleep for 15 to 30 minutes during breaks, and providing them a safe place to sleep before driving home.
Project Title: Staff Nurse Fatigue and Patient Safety
AHRQ Grant: HS11963
Research Area: WC
Principal Investigator: Ann Rogers, R.N.
Reference: Rogers AE. Sleep deprivation and ED night shift. *J Emerg Nurs.* 2002 Oct 28;28:469-70.

Risk of nursing errors does not appear to be improved by work breaks. Staff nurses frequently skip their breaks and/or meal periods to provide patient care. In an AHRQ-funded study, 393 nurses completed logbooks for 28 days, providing information about their work hours, errors, and episodes of drowsiness and actual sleep on duty. Participants were asked if they were able to take a break or sit down for a meal during their shift, to indicate the total duration of breaks taken during the shift, and if they were relieved of patient care responsibilities during their meals and/or break periods. Nurses reported having a break or meal period free of patient care responsibilities during fewer than half of the shifts they worked. There were no differences in the risk of errors reported

by nurses who had a break free of patient care responsibilities compared with those who were unable to take a break.
Project Title: Staff Nurse Fatigue and Patient Safety
AHRQ Grant: HS11963
Research Area: WC
Principal Investigator: Ann Rogers, R.N.
Reference: Rogers AE, Hwang WT, Scott LD. The effects of work breaks on staff nurse performance. *J Nurs Adm*. 2004 Nov;34(11):512-9.

Serious medical errors in ICUs can be reduced when traditional 30-hour-in-a-row extended work shifts are eliminated. The rate of serious medical errors committed by first-year doctors in training (interns) in two ICUs at a Boston hospital fell significantly when traditional 30-hour-in-a-row extended work shifts were eliminated, and the number of hours worked per week was reduced. AHRQ researchers found that interns made 36 percent more serious medical errors, including five times as many serious diagnostic errors, on the traditional schedule than on an intervention schedule that limited continuous work shifts to 16 hours and reduced scheduled weekly work from approximately 80 hours to 63. The rate of serious medication errors was 21 percent greater on the traditional schedule than on the new schedule.
Project Title: Effects of Extended Work Hours on ICU Patient Safety
AHRQ Grant: HS12032
Research Area: WC
Principal Investigator: Charles Czeisler, M.D.
Reference: Landrigan CP, Rothschild JM, Cronin JW, Kaushal R, Burdick E, Katz JT, Lilly CM, Stone PH, Lockley SW, Bates DW, Czeisler CA. Effect of reducing interns' work hours on serious medical errors in intensive care units. *N Engl J Med*. 2004 Oct 28;351(18): 1838-48.

Technology

Information technology provides an inexpensive method for detecting certain types of adverse events. Most health care organizations rely on spontaneous reporting, which detects only a fraction of adverse events. As a result, problems with safety may remain hidden. AHRQ researchers reviewed methodologies for detecting adverse events using information technology and found that tools such as event monitoring and natural language processing can inexpensively detect certain types of adverse events such as adverse drug events and nosocomial infections in clinical databases.
Project Title: Improving Quality with Outpatient Decision Support
Research Area: TRIP-II
AHRQ Grant: HS11046
Principal Investigator: David Bates, M.D.
Reference: Bates DW, Evans RS, Murff H, Stetson PD, Pizziferri L, Hripcsak G. Detecting adverse events using information technology. *J Am Med Inform Assoc*. 2003 Mar-Apr;10(2):115-28.

Computerized order entry can lead to an increased probability of medication errors. While computerized physician order entry (CPOE) is expected to significantly reduce medication errors, systems must be implemented thoughtfully to avoid facilitating certain types of errors. AHRQ researchers identified 22 situations in which a CPOE system increased the probability of medication errors. According to the study, these situations fell into two categories: information errors generated by fragmentation of data and hospitals' many information systems, and interface problems between humans and machines, where the computer's requirements were different than the way clinical work is organized. The study looked at clinicians' experience in using one CPOE system at a major urban teaching hospital.
Project Title: Improving Patient Safety by Reducing Medication Errors
Research Area: COE
AHRQ Grant: HS11530
Principal Investigator: Brian Strom, M.D.
Reference: Koppel R et al. Role of computerized physician order entry systems in facilitating medication errors. *JAMA* 2005 Mar 9;293:1197-1203.

New tool mines complex clinical data to detect and investigate targeted adverse patient safety events. Given the volume of patients seen at medical centers, detecting adverse events automatically from data already available electronically can greatly facilitate patient safety work. AHRQ researchers have created a tool for electronic detection of events in medical records that allows for selecting target events, assessing what information is available electronically, transforming raw data such as narrative notes into a coded format, querying the transformed data, verifying the accuracy of event detection, characterizing the events using systems and cognitive approaches, and using what is learned to improve detection. Adoption of standard terminology and standard clinical document architecture may improve the performance and generalizability of the tool.
Project Title: Mining Complex Clinical Data for Patient Safety Research
Research Area: CLIPS
AHRQ Grant: HS11806
Principal Investigator: George Hripcsak, M.D.
Reference: Hripcsak G, Bakken S, Stetson PD, Patel VL. Mining complex clinical data for patient safety research: a framework for event discovery. *J Biomed Inform*. 2003 Feb-Apr;36(1-2):120-30.

Information technology saves time for intensive care unit nurses by reducing the burden of documentation. ICU information systems can save documentation time for nurses, potentially freeing up nursing time for direct patient care. AHRQ researchers determined the

percentage of time that ICU nurses spent on documentation and other nursing activities before and after installation of a third-generation ICU information system. They found that the information system decreased the time ICU nurses spent on documentation by more than 30 percent. Almost half of the time saved on documentation was spent on patient assessment, a direct patient care task.
Project Title: Standardized Encounters to Study Patient Safety
Research Area: DCERPS
AHRQ Grant: HS11521
Principal Investigator: Matthew B. Weinger, M.D.
Reference: Wong DH, Gallegos Y, Weinger MB, Clack S, Slagle J, Anderson CT. Changes in intensive care unit nurse task activity after installation of a third-generation intensive care unit information system. *Crit Care Med.* 2003 Oct;31(10):2488-94.

Computer-based order entry can reduce catheter-related urinary tract infections. Up to 25 percent of hospitalized patients undergo urinary catheterization and catheter-related urinary tract infections are very common. Frequently, the catheters are left in place longer than necessary because of poor documentation. AHRQ researchers developed a computer-based order entry form that provides routine catheter care instructions and indicates catheter removal after 72 hours by default. This computer-based order entry decreased the duration of catheterization by about one-third, or 3 days.
Project Title: Targeting Interventions to Reduce Errors
Research Area: DCERPS
AHRQ Grant: HS11540
Principal Investigator: Timothy Hofer, M.D.
Reference: Cornia PB, Amory JK, Fraser S, Saint S, Lipsky BA. Computer-based order entry decreases duration of indwelling urinary catheterization in hospitalized patients. *Am J Med.* 2003 Apr 1;114(5):404-7.

✓Computer software helps detect patients who are most prone to falling or developing bed sores. AHRQ researchers have used New York State longitudinal data to demonstrate the utility of a Web-based management reporting system in long-term care settings. With the reporting system, researchers developed risk assessment models that predict probabilities of adverse events. Facilities have reported tremendous time saving, and some facilities have abandoned manual risk assessment tools altogether in favor of the system. One 300-bed nursing home in New York State steadily reduced the number of falls among its patients, going from 93 incidences in September 2002 to 53 in February 2003. Another New York nursing home using the system received a $30,000 reduction in its annual liability insurance premium. In addition, both 2005 patient safety awards by the New York State Department of Health went to nursing homes using the new technology.
Project Title: Using Prospective MDS Data to Enhance Resident Safety
Research Area: CLIPS
AHRQ Grant: HS11869
Principal Investigator: Christie Teigland, Ph.D.
Reference: Teigland C, Gardiner R, Li H, Bryne C. Clinical Informatics and Its usefulness for Assessing Risk and Preventing Falls and Pressure Ulcers in Nursing Home Environments. In: Henriksen K, Battles JB, Marks ES, Lewin DI, editors. *Advances in Patient Safety: From Research to Implementation. Vol. 3, Implemetation Issues.* AHRQ Publication Number 05-0021-3. Rockville, MD: Agency for Healthcare Research and Quality; Feb. 2005. p. 69-85. Article accessible at: Government Health IT (http://www.governmenthealthit.com/article90512-08-29-05-Web).

✓Natural language processing (NLP) may be effective in detecting adverse events. AHRQ researchers programmed an NLP system that translates narrative clinical notes into an electronically coded form. They used the system to process 2 years of inpatient medical charts with electronic discharge summaries from an urban, tertiary health care institution. Researchers found that NLP was three times more sensitive in detecting adverse events than traditional reporting, without complicating clinicians' routine work processes. Among NLP's potential health care applications, AHRQ researchers highlight the feasibility of nationwide screening for adverse events.
Project Title: Mining Complex Clinical Data for Patient Safety Research
Research Area: CLIPS
AHRQ Grant: HS11806
Principal Investigator: George Hripcsak, M.D.
Reference: Melton GB, Hripcsak G. Automated detection of adverse events using natural language processing of discharge summaries. *J Am Med Inform Assoc.* 2005 Jul-Aug;12(4):448-57.

✓Information technology design should keep end-users in mind. Electronic infusion pumps are widely used in hospitals throughout the U.S. to manage the administration of intravenous medications. However, AHRQ researchers found that difficulties often arise from poor coordination between the operator and the infusion pump as a result of interface design, leading to improper use. Infusion pumps often involve multiple modes of operation, substantial operator programming, and contain layered menus with complex branching schemes that present difficulties for health care providers. Practitioners must perform additional work to coordinate care and program the devices. The additional cognitive work involved in programming these devices presents unforeseen complications, such as adverse drug events, that can affect patient safety. For IT equipment and systems to support safe health care, there must be a coordination between human and machine.
Project Title: Linking User Error to Lab and Field Study of Medical IT

Research Area: CLIPS
AHRQ Grant: HS11816
Principal Investigator: Richard Cook, M.D.
Reference: Nemeth C, Nunnally M, O'Connor M, Klock PA, Cook R. Getting to the point: developing IT for the sharp end of healthcare. *J Biomed Inform.* 2005 Feb;38(1):18-25. Article available at: http://www.ctlab.org/documents/Getting%20to%20the%20Point.pdf.

Software can be integrated into geriatric care to prevent adverse events. AHRQ researchers evaluated the capacity of information technology, specifically software developed by the American Society of Consultant Pharmacists (ASCP) Research and Education Foundation, to prevent delirium and falls. The software is intended to assist in identifying problems in nursing homes during the monitoring stage of the medication use process. Researchers were successful in integrating the software with pharmacy workflow, and it aided the development of Medication Monitoring Care Plans and Flow Records for falls and delirium. In addition, preliminary results demonstrate acceptance of the software and the feasibility of incorporating a clinical informatics tool into the pharmaceutical care process.
Project Title: Pharmacist Technology for Nursing Home Resident Safety
Research Area: CLIPS
AHRQ Grant: HS11835
Principal Investigator: Kate Lapane, PhD
Reference: Lapane KL, Cameron K, Feinberg J. Technology for improving medication monitoring in nursing homes. In: Henriksen K, Battles JB, Marks ES, Lewin DI, editors. *Advances in Patient Safety: From Research to Implementation. Vol. 4, Programs, Tools, and Products.* AHRQ Publication Number 05-0021-4. Rockville, MD: Agency for Healthcare Research and Quality; Feb. 2005. p. 401-413.

Event Reporting

Hospital leaders are concerned about mandatory error reporting because it discourages staff from reporting and encourages lawsuits. A survey of hospital leaders found that nearly 70 percent believed that a nonconfidential, mandatory system would discourage staff from reporting patient safety incidents to their hospitals' own internal reporting system, and almost 80 percent thought it would encourage lawsuits. The researchers also found that more than 80 percent felt the names of both the hospital and involved staff members should be kept confidential, although respondents from States with mandatory, nonconfidential systems already in place were more willing to have hospital names released. Over 90 percent said their hospital would report serious injuries to their State hospital licensing agencies, but far fewer would report moderate or minor injuries. However, the hospital leaders surveyed generally did favor disclosing patient safety incidents to patients who were involved.
Project Title: Evaluate the Effects of Massachusetts Reporting System
AHRQ Grant: HS11928
Principal Investigator: Nancy Ridley, M.D.
Reference: Weissman JS, Annas CL, Epstein AM, Schneider EC, Clarridge B, Kirle L, Gatsonis C, Feibelmann S, Ridley N. Error reporting and disclosure systems: views from hospital leaders. *JAMA* 2005 Mar 16;293(11):1359-66.

Reporting system developed to gather valuable information on close calls also facilitates the use of targeted interventions. The University of Texas Close Call Reporting System is a voluntary and anonymous tool designed to gather valuable information about close calls, situations in which an accident, injury, or illness could have resulted, but was averted due to chance or a timely intervention. Information from close call reports also facilitates the development of targeted

interventions and ultimately leads to the identification and implementation of best practices in quality improvement. The tool's flexible design allows for potential adaptation and use by others. The Web site for the reporting system and training is accessible at http://www.utccrs.org/ccrs/.
Project Title: Translating Safety Practices from Aviation to Healthcare
Research Area: COE
AHRQ Grant: HS11544
Principal Investigator: Eric Thomas, M.D.

Anonymous event reporting tool allows hospitals to report errors without worry. The Partnership for Health and Accountability of the Georgia Hospital Association has created an online anonymous event reporting tool that can serve as a model for hospitals to voluntarily report medical errors. The Web site is at http://www.gha.org/pha/ and the tool at http://www.gha.org/pha/patientsafety/event_reporting/index.asp#live.
Project Title: Accountability and Health Safety, a Statewide Approach
Research Area: R-DEMO
AHRQ Grant: HS11918
Principal Investigator: Kenneth Thorpe, Ph.D.

✓The University of Mississippi Medical Center (UMMC) has implemented a new, Web-based, occurrence reporting system. The occurrence reporting system is divided into two sections: (1) general reporting (i.e., falls and unsafe conditions) and (2) medication error reporting. Since implementing the reporting system, significant changes in the process and level of reporting have been observed. Prior to its introduction, approximately 30 general and medication-related reports were received per month. In comparison, in the first 3 months of using the Web-based reporting system, 658 reports were received. These reports are received on a near real-time basis, allowing for immediate action to be taken when required. A public version of the patient safety reporting Web site is available. at: http://www.medicinematters.org.
Project Title: Addressing Preventable Medication Use Variance in Mississippi
Research Area: R-DEMO
AHRQ Grant: HS11923
Principal Investigator: C. Andrew Brown, M.D., M.P.H
Reference: Rudman WJ, Bailey JH, Hope C, Garrett P, Brown CA. The impact of a Web-based reporting system on the collection of medication error occurrence data. In: Henriksen K, Battles JB, Marks ES, Lewin DI, editors. *Advances in Patient Safety: From Research to Implementation. Vol. 3, Implementation Issues.* AHRQ Publication Number 05-0021-3. Rockville, MD: Agency for Healthcare Research and Quality; Feb. 2005. p. 195-205.

✓Intensive Care Unit reporting system available to the public. A fully functioning version of the Intensive Care Unit Safety Reporting System (ICUSRS) data input form is available for inspection at http://www.icusrs.org. The ICUSRS is a Web-based, anonymous, and confidential reporting form for ICU staff to report adverse events and near misses. Eighteen ICUs submitted a total of 854 reports to the ICUSRS during the first year of the project. AHRQ researchers found that a diverse group of ICUs will submit events, and conclude that the ICUSRS helps to identify rare events and lessons learned that can be shared among ICUs.
Project Title: Intensive Care Unit Safety Reporting System
Research Area: R-DEMO
AHRQ Grant: HS11902-03
Principal Investigator: Peter Pronovost, M.D., Ph.D.
Reference: Holzmueller CG, Pronovost PJ, Dickman F, Thompson DA, Wu AW, Lubomski LH, Fahey M, Steinwachs DM, Engineer L, Jaffrey A, Morlock LL, Dorman T. Creating the web-based intensive care unit safety

reporting system. *J Am Med Inform Assoc.* 2005 Mar-Apr;12(2):130-9.

✓Transfusion medicine reporting system will help increase patient safety. AHRQ researchers have developed the Medical Event Reporting System-Transfusion Medicine (MERS-TM) to manage and support event reporting in a systemized and effective manner. MERS-TM is an integrated system that facilitates the reporting of medical events related to blood components and transfusion procedures. These specific medical events may refer to any error, incident, deviation, variance, or sentinel/adverse occurrence. The reporting system seeks to improve blood product and transfusion safety through the systematic collection, analysis, and interpretation of information about events occurring at blood centers and transfusion medicine sites. A database is available for member organizations to study and monitor data collected from their own medical sites, as well as anonymous data from the central aggregate database.
Project Title: Reporting Systems and **Learning:** Best Practices
Research Area: R-DEMO
AHRQ Grant: HS11905
Principal Investigator: Harold Kaplan, M.D.
Reference: http://www.mers-tm.net/

Medication Safety

Errors associated with the use of smart infusion pumps. Medication errors and adverse drug events are common among critically ill cardiac surgery patients who receive medications through intravenous infusion pumps. AHRQ researchers studied smart infusion pump data for 735 cardiac surgery patients and found 180 serious medication errors. They concluded that although smart pumps have great promise, technological and nursing behavioral factors must be addressed if these pumps are to achieve their potential for improving medication safety.
Project Title: Improving Medication Safety Across Clinical Settings
Research Area: COE
AHRQ Grant: HS11534
Principal Investigator: David Bates, M.D.
Reference: Rothschild JM, Keohane CA, Cook EF, Orav EJ, Burdick E, Thompson S, Hayes J, Bates DW. A controlled trial of smart infusion pumps to improve medication safety in critically ill patients. *Crit Care Med.* 2005 Mar;33(3):533-40.

Dosing errors in children are associated with inadequate national standards for medication dosing based on patient weight and age. Although medications are prescribed to millions of children each year in the United States, little is known about medication errors in ambulatory pediatrics. In the process of completing a study to determine the prevalence of outpatient dosing errors, AHRQ researchers identified a number of issues with respect to medication errors in children. These include prescribing medication not labeled for use in children, discrepancies in published dosing recommendations for many medications, unclear guidelines on use of adult dosing recommendations for children of different ages and weights, and the lack of readily available, documented weights to determine appropriate weight-based doses for children. The authors suggest we need better national standards of medication-dosing that are appropriate for children and an improved ability to determine errors through databases that include children's weights as well as prescription information.
Project Title: Pediatric EBM-Getting Evidence Used at the Point of Care
AHRQ Grant: HS10516
Principal Investigator: Robert Davis, M.D., M.P.H.
Reference: McPhillips H, Stille C, Smith D, Pearson J, Stull J, Hecht J, Andrade S, Miller M, Davis R. Methodological challenges in describing medication dosing errors in children. In: Henriksen K, Battles JB, Marks ES, Lewin DI, editors. *Advances in Patient Safety: From Research to Implementation. Vol. 2, Concepts and Methodology.* AHRQ Publication No. 05-0021-2. Rockville, MD: Agency for Healthcare Research and Quality; Feb 2005. p. 213-23.

High rates of adverse events in long-term care facilities found during the ordering and monitoring stages of care. There were over 800 adverse drug events, of which more than 40 percent were judged preventable, in two large long-term care facilities during a 9-month period in 2000-2001, according to an AHRQ-funded study. Of the 225 adverse drug events considered to be serious, life-threatening, or fatal, over 60 percent were preventable. The study found that preventable adverse drug events occurred most often during the ordering and monitoring stages of care and that the two drugs most commonly involved were warfarin and atypical antipsychotic agents (olanzapine, risperidone, quetiapine, and clozapine).
Project Title: Reducing Adverse Drug Events in the Nursing Home
Research Area: TRIP
AHRQ Grant: HS10481
Principal Investigator: Jerry Gurwitz, M.D.
Reference: Gurwitz JH, Field TS, Judge J, Rochon P, Harrold LR, Cadoret C, Lee M, White K, LaPrino J, Erramuspe-Mainard J, DeFlorio M, Gavendo L, Auger J, Bates DW. The incidence of adverse drug events in two large academic long-term care facilities. *Am J Med.* 2005 Mar;118(3):251-8.

PDA-based drug information sources improve medication safety. Having drug information sources readily available at the point of care is one practice-improvement intervention that may reduce medication errors. PDAs offer great potential for improving quality in health care and several PDA-based drug information sources are available. AHRQ researchers developed

a quality and safety framework and used it to evaluate 11 drug information sources. Three of those sources met the criteria of the framework: Eprocrates Rx Pro, Lexi-Drugs, and *mobile*MICROMEDEX. Lexi-Drugs was found to be the most specific and complete PDA resource to optimize medication safety by reducing potential errors associated with insufficient or incomplete drug information. However, the researchers found that no resource sufficiently addressed all patient safety information needs for all cases, and it is often necessary to use more than one resource to reduce medication errors and improve patient safety.
Project Title: Training Clinicians to Use a Handheld Device for Electronic Prescribing
Research Area: CLIPS
AHRQ Grant: HS11808
Principal Investigator: Kimberly Galt, Pharm.D., FASHP
Reference: Galt KA, Rule AM, Houghton B, Young DO, Remington G. Personal digital assistant-based drug information sources: potential to improve medication safety. *J Med Libr Assoc.* 2005 Apr;93(2):229-36.

✓Medication safety guide for evaluating best practices in ambulatory care is available. AHRQ researchers have developed a quality and safety framework for health providers to evaluate medication safety in their practice. The tool helps providers identify areas for improvement and establish an action plan for various levels of implementation. A key aspect of the tool is its identification of methods to improve the environment for medication safety through individual behavior and policy or system changes. It also identifies implementation plans that need additional financial or expert resources beyond ambulatory care. The tool requires providers to think about safe practices pertaining to medication use, office environment, error management, workplace conditions, safety education, safety perceptions, and most importantly, the patient. The tool can be downloaded and distributed without permission.
Project Title: Impact of Personal Digital Assistant Devices on Medication Errors in Primary Care
Research Area: CLIPS
AHRQ Grant: HS11808
Principal Investigator: Kimberly Galt, Pharm.D., FASHP
Reference: http://chrp.creighton.edu/documents/BestPractices.pdf

Communication and Patient Support

Most people have difficulty understanding pharmaceutical label instructions, regardless of their cultural background and level of education. Pharmaceutical labels that give dosage instructions can be difficult to understand. AHRQ researchers investigated the errors in understanding instructions on pharmaceutical labels by subjects of different cultural and educational backgrounds. Labels of three medications of varying complexities were used in the study: oral rehydration therapy, cough medicine, and fever medicine. The results indicated that all subjects had considerable difficulty in interpreting pharmaceutical labels, independent of the cultural background and level of education. The authors suggest that the instructions be presented in a simplified manner and in multiple forms to meet the needs of multiple groups and communities.
Project Title: Mining Complex Clinical Data for Patient Safety Research
Research Area: CLIPS
AHRQ Grant: HS11806
Principal Investigator: George Hripcsak, M.D.
Reference: Patel VL, Branch T, Arocha JF. Errors in interpreting quantities as procedures: the case of pharmaceutical labels. *Int J Med Inform.* 2002 Nov 12;65(3):193-211.

Many chronically ill patients limit use of prescription drugs because of cost, but don't tell their doctors. About two-thirds of chronically ill adults who cut back on their medications because of the cost don't tell their doctors in advance. AHRQ researchers surveyed 4,055 adults age 50 years and older taking prescription medication for diabetes, depression, heart problems, or high cholesterol. Of these, 660 patients reported forgoing some medication in the prior year due to cost pressures, and two-thirds of this group reported they did not tell their clinicians in advance. However, less than one-third of the patients who spoke to their clinicians about the cost of prescription drugs reported being given information about programs to assist patients with medication costs or sources of lower-cost refills.
Project Title: Automated Assessments and the Quality of Diabetes Care
AHRQ Grant: HS10281
Principal Investigator: John Piette, M.D.
Reference: Piette JD, Heisler M, Wagner TH. Cost-related medication underuse: Do patients with chronic illnesses tell their doctors? *Arch Intern Med.* 2004 Sept. 13;164(16):1749-55.

Patients develop more positive attitudes toward electronic health care records and Web-based communication. AHRQ researchers found patients are becoming increasingly satisfied by Web-based communication with their health care providers while having online access to their electronic health care records. Researchers conducted an online survey of 4,282 members of the Geisinger Health System who were registered users of an application that allows patients to communicate electronically with their providers and view selected portions of their EHR. They also conducted focus groups with 25 patients using the system and conducted one-on-one interviews with 10 primary care clinicians.

Project Title: Impact of EpiCare on the Management of Diabetes in the Geisinger Health System
Research Area: IDSRN
AHRQ Grant: 290-00-0003 TO#2
Principal Investigator: Andrea Hassol, M.S.P.H.
Reference: Hassol A, Walker JM, Kidder D, Rokita K, Young D, Pierdon S, Deitz D, Kuck S, Ortiz E. Patient experiences and attitudes about access to a patient electronic healthcare record and linked web messaging. *J Am Med Inform Assoc.* 2004 Nov-Dec;11(6):505-13.

Video available to help providers disclose bad news. AHRQ researchers offer an ethical argument as to why a serious harm-causing medical error must be disclosed. All the mechanics of disclosure, including the initial contact, the meeting setting, who should be present, framing the disclosure, how to talk, empathizing, and follow-up are laid out as a guideline. A video tool to educate physicians and other medical personnel about these guidelines is available free of charge at http://www.gha.org/pha/video/index.asp.
Project Title: Accountability and Health Safety, a Statewide Approach
Research Area: R-DEMO
AHRQ Grant: HS11918
Principal Investigator: Kenneth Thorpe, Ph.D.
Reference: Banja J. Why, what and how ought harmed parties be told? The art, mechanics, and ambiguities of error disclosure. In: Hatlie M and Youngberg B, editors. *The Patient Safety Handbook.* Sudbury, MA.: Jones and Bartlett Publishers; 2003. p. 531-48.

Patients and physicians view disclosure of medical errors differently. AHRQ researchers undertook to determine patients' and physicians' attitudes about error disclosure. Thirteen focus groups were organized, including six groups of adult patients, four groups of academic and community physicians, and three groups of both physicians and patients. A total of 52 patients and 46 physicians participated. Patients wanted disclosure of all harmful errors. Physicians agreed that harmful errors should be disclosed but that they should "choose their words carefully." Patients also desired emotional support from physicians following errors, including an apology. However, physicians worried that an apology might create legal liability. Physicians may not be providing the information or emotional support that patients seek following harmful medical errors.
Project Title: Surveillance, Analysis, and Interventions to Improve Patient Safety
Research Area: R-DEMO
AHRQ Grant: HS11898
Principal Investigator: Victoria Fraser, M.D.
Reference: Gallagher TH, Waterman AD, Ebers AG, Fraser VJ, Levinson W. Patients' and physicians' attitudes regarding the disclosure of medical errors. *JAMA.* 2003 Feb 26;289(8):1001-7.

Visual aids may improve the accuracy of medication assessment and may be especially beneficial for patients with communication barriers. AHRQ researchers performed a study among long-term warfarin users in an anticoagulation clinic to assess concordance between patient and clinician reports of patient warfarin regimens. Bilingual research assistants asked patients to verbalize their prescribed weekly warfarin regimen, and identify this regimen from a digitized color menu of warfarin pills. Fifty percent of patients achieved verbal concordance, and 66 percent achieved visual concordance with clinicians regarding the weekly warfarin regimen. Clinician/patient discordance regarding patients' warfarin regimen was common, but occurred less frequently when patients identified their regimen with a visual aid. Visual aids may improve the accuracy of medication assessment and may be especially beneficial for patients with communication barriers.

Project Title: Promoting Effective Communication and Decisionmaking in Diverse Populations
AHRQ Grant: HS10856
Principal Investigator: Eugene Washington, M.D., M.Sc.
Reference: Schillinger D, Machtinger EL, Wang F, Chen L-L, Win K, Palacios J, Rodriguez M, Bindman A. Language, literacy, and communication regarding medication in an anticoagulation clinic: are pictures better than words? In: Henriksen K, Battles JB, Marks ES, Lewin DI, editors. *Advances in Patient Safety: From Research to Implementation. Vol. 2, Concepts and Methodology*. AHRQ Publication No. 05-0021-2. Rockville, MD: Agency for Healthcare Research and Quality; Feb 2005. p. 191-212.

Clinical Practice Change

Techniques to reduce the incidence of retained instruments and sponges after surgery include counting instruments and sponges before and after the procedure, and x-raying patients after surgery. A surgical instrument or sponge is left in more than 1,500 patients during surgery each year. AHRQ researchers studied 54 patients who had a total of 61 foreign bodies left inside them after surgery. Of the 61 foreign bodies, 69 percent were sponges and 31 percent were surgical instruments. They found that patients who had emergency surgery were nine times as likely to have a sponge or surgical instrument left in their body as patients undergoing the same procedure on a nonemergency basis. The risk increased by four times for patients who had unplanned changes in their procedure. The researchers note that a number of techniques are available to reduce these incidences, including counting instruments and sponges before and after the procedure, and x-raying patients after surgery.
Project title: Malpractice Insurers' Medical Error Prevention Study
Research Area: R-DEMO
AHRQ Grant: HS11886
Principal Investigator: David M. Studdert, M.D.
Reference: Gawande AA, Studdert DM, Orav EJ, Brennan TA, Zinner MJ. Risk factors for retained instruments and sponges after surgery. *N Engl J Med.* 2003 Jan 16;348(3):229-35.

Chlorhexidine gluconate reduces the risk of catheter-related blood stream infections by one-half compared to povidone iodine and can lead to reduced costs. More than 150 million intravascular devices are used annually in the United States, including more than 5 million central vascular catheter sites. However, intravascular catheters can lead to complications, such as catheter-related bloodstream infection. AHRQ researchers report that use of chlorhexidine gluconate solution to disinfect the central vascular catheter insertion site reduces the risk of catheter-related bloodstream infection by one-half compared with povidone iodine, and also leads to cost savings of $113 per catheter used. They suggest that the use of chlorhexidine in place of povidone for vascular catheter site disinfection is a simple and cost-effective method of improving patient safety.
Project Title: Targeting Interventions to Reduce Errors
Research Area: DCERPS
AHRQ Grant: HS11540
Principal Investigator: Timothy Hofer, M.D.
Reference: Chaiyakunapruk N, Veenstra DL, Lipsky BA, Sullivan SD, Saint S. Vascular catheter site care: the clinical and economic benefits of chlorhexidine gluconate compared with povidone iodine. *Clin Infect Dis.* 2003 Sep 15;37(6):764-71.

For impregnated catheters, minocycline/rifampin is more effective and economical for longer-term catheterization. Central venous catheters impregnated with minocycline/rifampin are known to be clinically superior to chlorhexidine/silver sulfadiazine impregnated catheters but

are more expensive. AHRQ researchers reported that central venous catheters coated with minocycline/rifampin are cost-effective, compared with chlorhexidine/silver sulfadiazine impregnated catheters, for patients catheterized for at least 1 week. They also lead to overall cost savings when patients are catheterized for 2 weeks or longer. The expected duration of catheterization should serve as a guiding tool for the use of antimicrobial catheters in high-risk patients.
Project Title: Targeting Interventions to Reduce Errors
Research Area: DCERPS
AHRQ Grant: HS11540
Principal Investigator: Timothy Hofer, M.D.
Reference: Marciante KD, Veenstra DL, Lipsky BA, Saint S. Which antimicrobial impregnated central venous catheter should we use? Modeling the costs and outcomes of antimicrobial catheter use. *Am J Infect Control*. 2003 Feb;31(1):1-8.

Various methods can reduce ventilator-associated pneumonia in selected patients. Pneumonia severe enough to require mechanical ventilation is a common and highly morbid condition occurring in about 10 to 25 percent of critically ill patients. AHRQ researchers have done a systematic review and synthesis of the studies to prevent ventilator-associated pneumonia. After evaluation of potential benefits and risks, the authors recommend several specific interventions to reduce the incidence of this condition: putting patients in a semi-recumbent position, using sucralfate rather than H2-antagonists to prevent stress ulcers, aspirating subglottic secretions, and using oscillating beds to increase mobility of lung secretions in selected patients.
Project Title: Targeting Interventions to Reduce Errors
Research Area: DCERPS
AHRQ Grant: HS11540
Principal Investigator: Timothy Hofer, M.D.
Reference: Collard HR, Saint S, Matthay MA. Prevention of ventilator-associated pneumonia: an evidence-based systematic review. *Ann Intern Med*. 2003 Mar 18;138(6): 494-501.

✓Understanding barriers to clinician use of PDAs is vital in evaluating ways to overcoming those barriers. PDAs can be a valuable resource for ambulatory care, but many physicians avoid using them at the point of care due to their fear of patients' perceptions. Although many physicians perceive that patients disapprove of physicians' use of PDAs, AHRQ researchers found that most patients are not averse to doctors using handheld devices. Rather, patients hold favorable attitudes toward physicians' use of PDAs, even among patients who are not computer literate. However, AHRQ researchers found that providing these survey data to physicians did not lead to significant increases in physicians' use of handhelds in the presence of patients.
Project Title: Improving Primary Care Patient Safety with Handheld Decision Support Systems
Research Area: CLIPS
AHRQ Grant: HS11820
Principal Investigator: Eta Berner, Ed.D.
Reference: Berner ES, Savage GT, Houston TK, Williams ES, Crawford MA, Ray MN. Impact of patient feedback on residents' handheld computer use: a multi-site study. *Medinfo*. 2004;11(Pt 1):582-6.

Organizational Change

Are critical pathways worth the money? Critical pathways are health care management plans that specify patient goals and the sequence and timing of actions necessary to achieve these goals with optimal efficiency. More than 80 percent of hospitals in the United States use critical pathways for at least some of their patients. AHRQ researchers assessed whether critical pathways have been successful in reducing patient length of stay and resource utilization. They found that most pathways reduced neither and cautioned that further evaluation of critical pathways is necessary before additional resources are consumed for this management strategy.
Project Title: Targeting Interventions to Reduce Errors
Research Area: DCERPS
AHRQ Grant: HS11540
Principal Investigator: Timothy Hofer, M.D.
Reference: Saint S, Hofer TP, Rose JS, Kaufman SR, McMahon LF Jr. Use of critical pathways to improve efficiency: a cautionary tale. *Am J Manag Care*. 2003 Nov;9(11):758-65.

Pittsburgh guidelines for health system redesign developed successful strategies for improving patient safety. Fundamental changes are needed in the health care system to improve patient safety, but there is no commonly accepted blueprint for redesigning the system. AHRQ researchers examined the Pittsburgh Regional Healthcare Initiative (PRHI)—a health system redesign project that includes 44 hospitals in 12 counties in southwestern Pennsylvania, along with major insurers, health care purchasers, and civic leaders. Key features in this design are linking patient outcomes data with processes of care; sharing that information widely; real-time error reporting; and quick, decentralized problem solving among participating institutions . The study helped develop successful strategies for improving patient safety. Many PRHI recommended practices and guidelines have been disseminated regionally and are available at http://www.prhi.org.
Project Title: Systems Approach for Improving Region-Wide Patient Safety
Research Area: R-DEMO
AHRQ Grant: HS11926
Principal Investigator: Carl A. Sirio, M.D.
Reference: Sirio CA., Segel KT, Keyser DJ., et al. Pittsburgh Regional Healthcare Initiative: a systems approach for achieving perfect patient

care. *Health Aff*. 2003 Sep-Oct;22(5): 157-65.

Preplanning enables well-defined courses of action and, at the same time, effectively handles unlikely events in the cardiac operating room. Plans and planning behavior by health professionals are fundamental to patient safety, but planned actions in health care are rarely static. Preparation facilitates effective, expected courses of action while accommodating real-world contingencies and unforeseen circumstances. An AHRQ study found that successful cardiac surgery requires having the right tools for the job in the right place at the right time, even in the face of unforeseen circumstances. AHRQ researchers collected and analyzed video and audio recordings of 20 surgical cases involving both coronary artery bypass surgery and heart valve replacement and described how preplanning enables well-defined courses of action and at the same time effectively handles unlikely events in the cardiac operating room.
Project Title: Ethnography of Transitions in Cardiac Care
AHRQ Grant: HS12003
Research Area: WC
Principal Investigator: Paul Gorman, M.D.
Reference: Hazlehurst B, McMullen C, Gorman P. Getting the right tools for the job: preparatory system configuration and active replanning in cardiac surgery. In: Santos E, Willett P, editors. *IEEE International Conference on Systems, Man & Cybernetics. Vol 2*. Piscataway, New Jersey; 2003. p. 1784-91.

Using virtual patient care units may improve patient safety and outcomes. Research data from health care systems are usually complex and present information as a snapshot in time. This makes application difficult in a dynamically changing health care system. To transform complex data into information that nurses can use, AHRQ researchers used computational modeling, a set of tools that allows users to create a virtual model of a particular system such as a patient care unit. Based on real patient care units, they created 16 virtual units that are functionally similar to their real counterparts in key characteristics of the unit and patient safety outcomes.
Project Title: The Impact of Nursing Unit Characteristics on Outcomes
AHRQ Grant: HS11973
Research Area: WC
Principal Investigator: Joyce Verran, M.D.
Reference: Effken JA, Brewer BB, Patil A, Lamb GS, Verran JA, Carley KM. Using computational modeling to transform nursing data into actionable information. *J Biomed Inform*. 2003 Aug-Oct;36(4-5):351-61.

Primary care offices can be made safer by emphasizing information systems, promoting a culture of quality, and improving the environment. The Minimizing Error, Maximizing Outcome (MEMO) Study used a conceptual model to relate office working conditions to quality of care, as mediated by physician reactions. Physician surveys assessed office environment and organizational climate. A chaotic office atmosphere was strongly associated with physician stress, a lack of quality emphasis was associated with past errors, and a lack of emphasis on information and communication was associated with a higher likelihood of future errors. AHRQ researchers found that primary care offices could be made safer by emphasizing information systems, promoting a culture of quality, and improving the environment.
Project Title: Minimizing Error, Maximizing Outcome (MEMO): The Physician Worklife Study II
AHRQ Grant: HS11955-03
Principal Investigator: Mark Linzer, M.D.
Reference: Linzer M, Manwell LB, Mundt M, Williams E, Maguire A, McMurray J, Plane MB. Organizational climate, stress, and error in primary care: the MEMO Study. In: Henriksen K, Battles JB, Marks ES, Lewin DI, editors. *Advances in Patient Safety: From Research to Implementation. Vol. 1, Research Findings.* AHRQ Publication No. 05-0021-1. Rockville, MD: Agency for Healthcare Research and Quality; Feb 2005. p. 65-77.

Do too many distractions affect nursing care? The acute care hospital environment is filled with numerous distractions. Within this environment, professional nurses make clinical judgments about their patients, whose conditions may change minute by minute. As a result, nurses constantly organize and reorganize the priorities and tasks of care to accommodate patients' fluctuating status. AHRQ researchers describe an ongoing research study aimed at exploring the effect of interruptions on the cognitive work of nursing. By combining human factors techniques and qualitative observation of nurses in practice, researchers produced a cognitive pathway, a unique visual graphic that offers a perspective of the nature of nurses' work and the effect of interruptions and cognitive load on omissions and errors in care.
Project Title: Work Environment: Effects on Quality of Healthcare
Research Area: WC
AHRQ Grant: HS11983
Principal Investigator: Bradley Evanoff, M.D., M.P.H.
Reference: Potter P, Wolf L, Boxerman S, Grayson D, Sledge J, Dunagan C, Evanoff B. An analysis of nurses' cognitive work: a new perspective for understanding medical errors. In: Henriksen K, Battles JB, Marks ES, Lewin DI, editors. *Advances in Patient Safety: From Research to Implementation. Vol. 1, Research Findings.* AHRQ Publication No. 05-0021-1. Rockville, MD: Agency for Healthcare Research and Quality; Feb 2005. p. 39-51.

Education and Training

New national AHRQ Patient Safety Network Web site launched. The new Web site, AHRQ Patient

Safety Network, or AHRQ PSNet, is a national "one-stop" portal of resources for improving patient safety and preventing medical errors. AHRQ PSNet is the first comprehensive effort to help health care providers, administrators, and consumers learn about all aspects of patient safety. The site provides a wide variety of patient safety resources, information on tools and conferences, and more. AHRQ PSNet users can customize the site around their unique interests and needs by creating a "My PSNet" page. In addition, weekly AHRQ PSNet updates are available to subscribers on patient safety findings, literature, tools, and conferences. Additionally, a carefully annotated collection of seminal patient safety journal articles resides in a "Classics" section. Visit the AHRQ PSNet at http://psnet.ahrq.gov/.

The successful AHRQ WebM&M was recently redesigned to include new features. The AHRQ WebM&M Web site publishes illustrative cases of medical errors on the Internet, accompanied by expert commentaries, references, and opportunities to earn continuing medical education (CME) credits and continuing educational units (CEUs). It also includes a section on perspectives on safety and a “Did You Know?” section. AHRQ Web M&M is modeled on hospital morbidity and mortality conferences; three cases are posted each month to illustrate diverse patient safety issues, and case discussions are provided. The Web site, which had more than 30,000 visitors in its most recent month, has become a very popular source for medical error case discussions and has garnered highly positive feedback. AHRQ WebM&M represents one of the most successful on-line journals involving patient safety and medical error discussions.

Project Title: Develop, Implement, Maintain, and Assess a National Electronic Web-based Morbidity and Mortality Conference Site
AHRQ Project No: 290-01-0011
Principal Investigator: Robert Wachter, M.D.
Reference: Wachter RM, Shojania KG, Minichiello T, Flanders SA, Hartma EE. AHRQ WebM&M-online medical error reporting and analysis. In: Henriksen K, Battles JB, Marks ES, Lewin DI, editors. *Advances in Patient Safety: From Research to Implementation. Vol. 4, Programs, Tools and Products.* AHRQ Publication No. 05-0021-4. Rockville, MD: Agency for Healthcare Research and Quality; Feb 2005. p. 211-21.

Improving patient safety through Web-based education. The National Patient Safety Foundation collaborated with physicians, nurses, patient representatives, and educators throughout the United States to develop a standard method of patient safety education. Three interactive educational modules were developed: one each for physicians, nurses, and patients. The physician's module offers a total of six continuing medical education (CME) credits, and the nurse's module offers continuing educational units (CEUs). The patient's module provides fundamental information to achieve safe patient care. The Web sites are:

- **Physicians:** http://www.npsf.org/html/mcw/physicians.html
- **Nurses:** http://www.npsf.org/html/mcw/nurses.html
- **Patients:** http://www.npsf.org/html/patients_web.html
  Project Title: Improved Patient Safety through Web-Based Education

Research Area: Dis-ED
AHRQ Grant: HS12043
Principal Investigator: William Hendee, Ph.D.

Video monitoring of emergency care improves patient safety. Video recording is a powerful tool for documenting clinician performance and revealing safety and systems issues not identified by human observation. AHRQ researchers employed video recording to document the real emergency procedures and critical events in a trauma center and identified patient safety, clinical, quality assurance, and ergonomic issues, as well as systems failures. They suggest that video recording is a useful feedback and training tool and provides a reusable record of events that can be repeatedly reviewed and used as research data. In addition to improving patient safety, participation in video recording was beneficial to health care providers also, as they could review the universal precautions to protect themselves and develop best practices for emergency care.
Project Title: Brief Risky High Benefit Procedures: Best Practice Model
Research Area: SRBP
AHRQ Grant: HS11279
Principal Investigator: Colin Mackenzie, M.D.
Reference: Mackenzie CF, Xiao Y. Video techniques and data compared with observation in emergency trauma care. *Qual Saf Health Care.* 2003 Dec;12:Suppl 2, ii51-7.

SimCare: An assessment and teaching tool for diabetes care. A major factor in the high rates of medical error in the treatment of patients with diabetes and other chronic diseases is the complexity of the tasks that physicians must complete. AHRQ researchers developed SimCare, a dynamic and interactive model that simulates diabetes management in the office-based practice setting. SimCare presents a series of cases based on clinical situations representing task features that are thought to be the source of both realistic care decisions and medical errors. Physicians select treatment options from an unguided set of choices similar to those available in routine office practice. The cumulative record of the chosen treatment moves is available for analysis and comparison with an expert's sequence of moves for each simulated patient. SimCare is potentially both an assessment and a teaching tool that enables the observation and analysis of physician decisionmaking in the simulated practice setting.
Project Title: Physician intervention to improve diabetes care.
AHRQ Grant: HS10639
Principal Investigator: Patrick J. O'Connor, M.D., M.P.H.
Reference: Dutta P, Biltz GR, Johnson PE, Sperl-Hillen JM, Rush WA, Duncan JE, O'Connor PJ. SimCare: a model for studying physician decisionmaking activity. In: Henriksen K, Battles JB, Marks ES, Lewin DI, editors. *Advances in Patient Safety: From Research to Implementation. Vol. 4, Programs, Tools and Products.* AHRQ Publication No. 05-0021-4. Rockville, MD: Agency for Healthcare Research and Quality; Feb 2005. p. 179-92.

✓Simulator provides a reliable assessment of technical skills vital to mastering minimally invasive endoscopic sinus surgeries. A simulator training curriculum was developed with the endoscopic sinus surgery simulator (ES3) and validated by 34 medical students and 4 otolaryngology residents. Technical errors were identified, quantified, used to train and monitor surgical performance, and used for outcomes analysis to

improve patient safety. Examples of current validated metrics include: time-to-completion, errors, economy of motion, and psychomotor tracking. Correlation with psychometric parameters (perception, psychomotor, visiospatial, cognitive mapping, etc.) will be used to identify technical errors and to validate the simulator and the curriculum. Scores on the ES3, correlate highly with scores on previously validated measures of perceptual, visiospatial, and psychomotor performance.
Project Title: Identifying and Reducing Errors with Surgical Simulation
Research Area: CLIPS
AHRQ Grant: HS11866
Principal Investigator: Marvin Fried, M.D.
Reference: Arora H, Uribe J, Ralph W, Zeltsan M, Cuellar H, Gallagher A, Fried MP. Assessment of construct validity of the endoscopic sinus surgery simulator. *Arch Otolaryngol Head Neck Surg.* 2005 Mar;131(3):217-221.

✓Discovering the cognitive causes of errors may help detection and prevention. AHRQ researchers studied the electronic recording and presentation of clinical information from a cognitive point of view, studying various levels of clinician expertise. The group found that structured (rather than narrative) data resulted in better recall and better inferences for novice and intermediate level clinicians. This suggests a need for structured data entry or effective natural language processing to structure the data to help reduce errors. In addition, various stakeholders (administrators, engineers, nurses, and physicians) interpret error causation differently, and there was a greater tendency to assign human blame to errors when errors were presented retrospectively.
Project Title: Mining Complex Clinical Data for Patient Safety Research
Research Area: CLIPS
AHRQ Grant: HS11806
Principal Investigator: George Hripcsak, M.D.
Reference: Bakken S, Cimino JJ, Hripcsak G. Promoting patient safety and enabling evidence-based practice through informatics. *Med Care.* 2004 Feb;42(2 Suppl):II49-56.

Safety in Intensive Care Units (ICUs)

Complicated, error-prone devices are commonly used in ICUs. The volume of patient data, lighting level, ambient noise, and scheduling all result in provider and patient stress in ICUs. These difficult working conditions make errors more probable and are risk factors for provider burnout and negative outcomes for patients. AHRQ researchers identified auditory alarms on ICU equipment, ICU syndrome (delirium), and needlesticks as examples of such problems. They stress that basic lessons in ergonomics, human factors, and human performance fail to apply in the complex medical environment of the ICU and there is a lot of room for improvement—from easy access to the dialysis machine to adjusting the manpower schedule.
Project Title: Development Center for Patient Safety Research
Research Area: DCERPS
AHRQ Grant: HS11562
Principal Investigator: Yan Xiao, M.D.
Reference: Donchin Y, Seagull FJ. The hostile environment of the intensive care unit. *Curr Opin Crit Care.* 2002 Aug;8(4):316-20.

Most airway events in ICUs are preventable. More than half of airway events such as coughing, spasms of the larynx, excessive salivation and breath holding, and other complications involving endotracheal tubes in ICUs are preventable, according to AHRQ researchers. To help limit the impact of these events, researchers suggest that prevention efforts focus on critically ill infants and patients with complex medical conditions. Also, ICU managers should ensure appropriate staffing to limit the impact of airway events when they occur.
Project Title: Intensive Care Unit Safety Reporting System
Research Area: R-DEMO
AHRQ Grant: HS14246
Principal Investigator: Peter Pronovost, M.D.
Reference: Needham DM, Thompson DA, Holzmueller CG, Dorman T, Lubomski LH, Wu AW, Morlock LL, Pronovost PJ. A system factors analysis of airway events from the Intensive Care Unit Safety Reporting System (ICUSRS). *Crit Care Med.* 2004 Nov;32(11):2227-33.

AHRQ researchers provide a practical framework for increasing safety in the ICU. Complex systems such as ICUs are breeding grounds for errors and the resulting adverse events because interdependent components interact in unexpected ways. Patients are cared for by many providers with varying levels of expertise across several disciplines, and these providers use highly sensitive and potentially dangerous technologies and medications. Such complex systems require careful planning, excellent teamwork and communication, and designed redundancies to recheck for proper care processes. AHRQ researchers provide a practical framework for improving patient safety.
Project Title: Statewide Efforts to Improve Care in Intensive Care Units
Research Area: R-DEMO
AHRQ Grant: HS11902

Principal Investigator: Peter Pronovost, M.D.
Reference: Pronovost PJ, Wu AW, Sexton JB. Acute decompensation after removing a central line: practical approaches to increasing safety in the intensive care unit. *Ann Intern Med.* 2004 Jun 15;140(12):1025-33.

For more information

For additional information on AHRQ-funded patient safety research and findings, please visit the AHRQ Web site at http://www.ahrq.gov or the AHRQ Patient Safety Network at http://psnet.ahrq.gov/ or contact:

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Note:

The Research Areas are different funding categories:

- R-DEMO: Reporting System Demonstrations
- DCERPS: Developing Centers of Excellence in Research on Patient Safety
- HRSA: Health Resources and Services Administration
- SRBP: Systems-Related Best Practices
- WC: Effects of Working Conditions on Patient Safety
- CLIPS: Clinical Informatics and Patient Safety
- Dis-ED: Patient Safety Research Dissemination and Education
- COE: Centers of Excellence for Patient Safety Research and Practice
- TRIP: Translating Research into Practice
- CERTs: Centers for Education and Research on Therapeutics
- IDSRN: Integrated Delivery Systems Research Networks

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